MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

BMM1014 – MATHEMATICS FOR MANAGERS
(All sections / Groups)

06 MARCH 2020
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 printed pages excluding the cover page, with 4 questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

5. Formulae are attached at the end of the question paper.

QUESTION 1:

a. A furniture factory that specialized in making wooden dining table sets has a monthly fixed cost of RM30,000 and production cost of RM1,200 for each dining table set made. In a particular month, all the dining table sets were sold at RM1,800 per set.

   i. Find the break-even quantity.   (3 marks)

   ii. Find the break-even quantity if the monthly fixed cost increases to RM42,000.
                                                         (3 marks)

   iii. Find the break-even quantity if each set of dining table is sold at a discount of 20%.   (4 marks)

   iv. If the factory was able to produce and sell 80 sets of dining table in that month, find the selling price per set for generating a profit of RM20,000.   (4 marks)

b. Home Electrical Appliances Store mainly sells air conditioners, refrigerators, and washing machines. The store has a total of 200 square metres of warehouse space, and 15 hours of promotion time per day. Each air conditioner requires a 10 square metre of warehouse space and 1 hour of promotions per day. Each refrigerator requires a 20 square metre of warehouse space and 1 hour of promotions per day. Each washing machine requires a 20 square metre of warehouse space and 1 hour of promotions per day. If the selling price of each unit of air conditioner, refrigerator, and washing machine is RM1,000, RM2,000 and RM1,500 respectively, how many units of air conditioners, refrigerators, and washing machines should be sold per day for a total revenue of RM19,000?   (11 marks)

                                                                     (Total: 25 marks)

QUESTION 2:

A new fast food restaurant sells two type of burgers: Turkey and Veggie. The selling price of each Turkey and Veggie burger is RM12 and RM9 respectively. To cover the daily operation costs, the restaurant has to sell at least 200 burgers a day. A Turkey burger costs RM6 and requires 4 minutes of cooking time. A Veggie burger costs RM4 and requires 2 minutes of cooking time. Given that the daily budget of the total cost of all the burgers is RM1,200 and the available total cooking time is 12 hours.

a. Formulate the above problem as a Linear Programming problem.   (5 marks)
b. Sketch the graph by showing all the corner points and the feasible region of the above problem.   (14 marks)
c. Find the optimal solution and the maximum profit.   (6 marks)

                                                                     (Total: 25 marks)

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QUESTION 3:

a. How long (in year) will it take for an initial amount of RM1,000 to grow to RM3,160 if the saving earns interest at the rate of 3.6% compounded monthly?

(8 marks)

b. What is the accumulated amount after 5 years if a sum of RM1,000 is deposited into an account that pay 2.0% interest compounded continuously?   (3 marks)

c. You plan to further your study 5 years later. The estimated cost for a Master's degree is around RM30,000. If a sinking fund is established for the purpose through equal monthly savings into an account earning interest of 2.4% compounded monthly, how much should you deposit into the account each month?   (4 marks)

d. A bank is offering a 10-year loan at the interest rate of 3.0% per year compounded monthly to your company.
    i. How much does your company need to pay for the monthly repayment if your company borrow RM200,000 from the bank?   (4 marks)
    ii. What is the total amount of interest paid over the term of the loan?   (2 marks)
    iii. If your company can only afford to pay monthly repayment of RM1,600, how much can your company borrow for the same loan term and interest rate?

(4 marks)

(Total: 25 marks)

Continued...

QUESTION 4:

a. The total revenue (R) and total cost (C) functions of a company producing and selling x units of leather wallets are given by:

$$R(x) = -x^2 + 233x - 4$$

$$C(x) = 2x^2 + 5x + 96$$

If all the leather wallets produced are sold,

i.   find the total profit function.   (2 marks)
ii. how many leather wallets should be produced and sold in order to maximize the profit using Second Derivative Test?   (5 marks)
iii. what is the maximum profit?   (2 marks)

b. The total profit of Mountain Vege Company depends on the planting and selling of two type of vegetables: Broccoli (x) and Cabbage (y). The company's total revenue (R) and total cost (C) functions are defined respectively as:

$$R(x, y) = -x^3 + 9y^2 + 60y + 4200$$

$$C(x, y) = 2y^3 - 12x^2 - 27x + 1000$$

If all the planted vegetables are sold,

i.   find the total profit function.   (2 marks)
ii. how many of each vegetable should be planted and sold for maximizing the profit?   (14 marks)

(Total: 25 marks)

Continued...

APPENDIX:

LIST OF FORMULAE

1. **Quadratic Formula**

   The solution of the equation $ax^2 + bx + c = 0$:

   $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \text{ where } a \neq 0$$

2. **Simple Interest**

   Interest, $I = Prt$

   Accumulated amount, $A = P(1 + rt)$

   where: P = principal, r = interest rate, t = number of years

3. **Compound Interest**

   Accumulated amount, $A = P(1 + i)^n$

   where: $i = r/m$
   $n = mt$
   m = number of conversion periods per year

4. **Continuous Compound Interest**

   $A = Pe^{rt}$

5. **Effective Rate of Interest**

   $$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1$$

6. **Present Value for Compound Interest**

   $P = A(1 + i)^{-n}$

7. **Future Value of an Annuity**

   $$S = R\left[\frac{(1 + i)^n - 1}{i}\right]$$

   where: S = future value of ordinary annuity of n payments of R dollar of periodic payment.

   Continued...

8. **Present Value of an Annuity**

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

where: P = present value of ordinary annuity of n payments of R dollar of periodic payment.

9. **Amortization Formula**

$$R = \frac{Pi}{1-(1+i)^{-n}}$$

where: R = periodic payment on a loan of P dollars to be amortized over n periods.

10. **Sinking Fund Formula**

$$R = \frac{Si}{(1+i)^{n}-1}$$

where: R = periodic payment required to accumulate S dollars over n periods.

11. **Break-even point** $= \dfrac{\text{Fixed cost}}{\text{Contribution per unit}}$

    Sales (unit) $= \dfrac{\text{Fixed cost} + \text{Target profit}}{\text{Contribution per unit}}$

where: Contribution per unit = unit selling price − unit variable cost

CALCULUS

12. **Product rule**

$$f(x) = u(x) \cdot v(x)$$

$$f'(x) = u(x) \cdot \frac{dv}{dx} + v(x) \cdot \frac{du}{dx}$$

13. **Quotient rule**

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\dfrac{du}{dx} - u(x)\dfrac{dv}{dx}}{[v(x)]^{2}}$$

End of Paper